CLAIMS

What is claimed is:

1. A computer-implemented method for determining Value-at-Risk (VAR), said method comprising the steps of:

(a) determining a probability preserving transformation between a set of correlated price returns of one or more financial instruments and of standard Gaussian variates using a probability model;

(b) creating a set of loss threshold values at which a lower tail of a probability distribution of portfolio value change is to be evaluated;

(c) selecting a value from the set of loss threshold values;

(d) determining a limit-state surface on which the portfolio value change is equal to the selected loss threshold value of step (c) by expressing a limit-state-equation in terms of one or more standard Gaussian variates using the probability preserving transformation calculated in step (a);

(e) finding one or more design points on the limit-state surface closest to an origin of a standard Gaussian space;

(f) calculating a probability of portfolio value change not exceeding the selected loss threshold value using one or more methods from the group consisting of (First-Order Reliability Method, Second-Order Reliability Method, or importance sampling around the one or more design points);

(g) repeating Steps (c) through (f) for each selected loss threshold value of step (b), whereby a lower tail of the cumulative probability distribution of portfolio value change is created; and

(h) determining a Value-at-Risk as a desired quantile of the lower tail of the cumulative probability distribution of portfolio value change.

2. The computer-implemented method of claim 1, further comprising the step of calculating expected tail loss by integrating the lower tail of the cumulative probability distribution of portfolio value change beyond the desired quantile.

3. The computer-implemented method of claim 1, wherein the probability model includes using Stochastic differential equations describing fluctuations of market prices with time leading to the probability distribution of price returns.

4. The computer-implemented method of claim 1, wherein the calculating a probability preserving transformation step (a) includes: deriving a set of scalar equations that relates each of the price returns, in general non-Gaussian, to a set of Gaussian variates and calculating the correlations between the Gaussian variates from linear correlations between the price returns.

5. The computer-implemented method of claim 1, further comprising setting up a pricing model for each derivative position in the portfolio whereby the portfolio value is calculated as a function of price of the underlying instrument.

6. The computer-implemented method of claim 5 wherein the pricing model is selected from the group consisting of: the Black-Scholes model for European options, or Lattice or Finite-Difference model for American options.

8. A system for determining Value-at-Risk (VAR), said system comprising of:

a computer; and

a software program being executable by the computer, the software program for executing the steps:

(a) determining a probability preserving transformation between a set of correlated price returns of one or more financial instruments and of standard Gaussian variates using a probability model;

(b) creating a set of loss threshold values at which a lower tail of a probability distribution of portfolio value change is to be evaluated;

(c) selecting a value from the set of loss threshold values;

(d) determining a limit-state surface on which the portfolio value change is equal to the selected loss threshold value of step (c) by expressing a limit-state-equation in terms of one or more standard Gaussian variates using the probability preserving transformation calculated in step (a);

(e) finding one or more design points on the limit-state surface closest to an origin of a standard Gaussian space;

(f) calculating a probability of portfolio value change not exceeding the selected loss threshold value using one or more methods from the group consisting of (First-Order Reliability Method, Second-Order Reliability Method, or importance sampling around the one or more design points);

(g) repeating steps (c) through (f) for each selected loss threshold value of step (b), whereby a lower tail of the cumulative probability distribution of portfolio value change is created; and

(h) determining a Value-at-Risk as a desired quantile of the lower tail of the cumulative probability distribution of portfolio value change.

9. The system of claim 8, further comprising:

a market data database for storing and retrieving a set of market data for one or more financial instruments, the market data database being accessible by the computer, and

a portfolio database for storing and retrieving a set of portfolio data of financial derivatives, the portfolio database being accessible by the computer.

10. A computer-usable medium having computer-readable program code embodied therein for causing a computer to perform the steps of:

(a) determining a probability preserving transformation between a set of correlated price returns of one or more financial instruments and of standard Gaussian variates using a probability model;

(b) creating a set of loss threshold values at which a lower tail of a probability distribution of portfolio value change is to be evaluated;

(c) selecting a value from the set of loss threshold values;

(d) determining a limit-state surface on which the portfolio value change is equal to the selected loss threshold value of step (c) by expressing a limit-state-equation in terms of one or more standard Gaussian variates using the probability preserving transformation calculated in step (a);

(e) finding one or more design points on the limit-state surface closest to an origin of a standard Gaussian space;

(f) calculating a probability of portfolio value change not exceeding the selected loss threshold value using one or more methods from the group consisting of (First-Order Reliability Method, Second-Order Reliability Method, or importance sampling around the one or more design points);

(g) repeating Steps (c) through (f) for each selected loss threshold value of step (b), whereby a lower tail of the cumulative probability distribution of portfolio value change is created; and

(h) determining a Value-at-Risk as a desired quantile of the lower tail of the cumulative probability distribution of portfolio value change.

11. The computer-usable medium of claim 10, further having computer-readable program code embodied therein for causing a computer to perform the step of calculating expected tail loss by integrating the lower tail of the cumulative probability distribution of portfolio value change beyond the desired quantile.